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It is shocking to learn that all the known phosphate deposits in the world will last at best only 250 years at the present rate of consumption; that America now furnishes two-thirds of the world's supply and sells half of it to foreign lands; while it would require our entire production of phosphates upon our own soil to give back to the soil what our corn crop alone takes from it.

The author is to be congratulated on producing a strong book in a very vital field. Its influence should be constructive in a high degree.

J. PAUL GOODE

Epitome of the Geology of New South Wales. By E. F. PITTMAN.

Circular No. 9. Sydney: Mining and Geological Museum, 1909. Pp. 9, with geologic map.

This little pamphlet giving in a very brief, condensed form the principal features of the geology of this large Australian province has just come to the reviewer's attention. Those who frequently have occasion to familiarize themselves with the salient points in the geology of various portions of other continents often have longed for a series of just such outlines as this. To pick the desired information from separate volumes of a long array of standard geologic reports is a tedious and time-consuming task. A good map and the essential facts of a far-away country brought together and made available for ready use is a boon to every geologist who may have occasion to refer to that region. Now that geological studies are world-wide it is to be hoped that other countries and provinces will follow the example of New South Wales.

R. T. C.

Life and Letters of Josiah Dwight Whitney. By EDWIN TENNEY

BREWSTER. Boston: Houghton Mifflin Co., 1909. Pp. 411, 18 illustrations.

In this biography the curtain is drawn aside and the reader is introduced intimately to one of the most conspicuous of the pioneers of American geology. When Whitney commenced his field work as an assistant on the first geological survey of New Hampshire in 1839, almost the whole of the United States was geologically an unknown land. The story of Whitney's life as it is unfolded in this book carries with it much of the history of several of the early surveys in which he took a leading part. These are the survey of the Lake Superior region (1847-50) which turned him from chemistry, toward which he had been preparing himself, to geology, and the Iowa State Survey, to which he was appointed in 1855 and which brought him

into active service in Wisconsin and Illinois as well. In 1854 appeared Whitney's *Metallic Wealth of the United States* which was the most notable work on the subject at the time.

With his fortieth year comes the end of the first of the three periods into which his life naturally divides itself. He has been by turn chemist, mining expert, geological surveyor, but never the single head of a survey. With the appointment as organizer and chief of the California Survey he is geologist and his own master.

The years in California were a period of ceaseless activity for Whitney, for the difficulties confronting this young survey in a new state of the dimensions of California were great. It was at this time that the youthful Baron von Richthofen came to California to study volcanic phenomena and became associated for a short time with the state survey. Out of this developed the lifelong friendship between these two geologists. Richthofen's geological survey of China was Whitney's idea, and the Baron often used to recall the New Year's Eve between 1867 and 1868 when he and Whitney sat up all night and planned the China Survey.

In 1874 the California Survey came to an end. Its termination apparently was due to a variety of causes. The survey had been from the first the project of a small group of enlightened persons, not the response to any popular demand, and its function and work were but poorly appreciated. In addition the survey earned the ill-will of many promoters, especially the oil companies, by steadily minimizing, with perhaps unnecessary directness and emphasis, the commercial possibilities of the California oil fields. Such a combination of causes—the bad financial status of the state, a general lack of insight and appreciation of scientific work by its influential people, the opposition of unscrupulous promoters, and an unfortunate cavalier tone and frequent want of tact displayed by the state geologist which stimulated general antagonism from the mining interests and from the governor—led to the final wreck of the survey.

The California Survey was in a way the pathfinder for the U.S. Geological Survey which was organized under King, Whitney's protégé, in 1879. The first director and some of his best-trained associates had received their geological training and field experience under Whitney. The methods of field work and topographic surveying adopted in California were later transplanted in the larger organization. The California Survey first shook the tree of which the federal survey has gathered up most of the fruit.

After such active pioneer field work and incessant travel for so many years, Whitney settled down for the latter part of his life as Sturgis-Hooper professor at Harvard. He did only a limited amount of teaching to small

advanced classes, but though his pupils were not numerous, they were picked men, and the list of those who were trained under him includes not a few of the leading geologists of the country today.

The story is chiefly told by his letters to his favorite brother, William Dwight Whitney—letters which reveal the man without the reserve which usually accompanied him, and which portray in a very graphic and vivid style much of the history of early geological exploration in this country.

R. T. C.

Iowa Geological Survey, Vol. XIX, Annual Report, 1908. With Accompanying Papers. Des Moines, 1909. Pp. 806, 22 plates, 117 figures.

Coal is the principal topic of this volume. Besides the *Seventeenth Annual Report of the State Geologist*, Professor Samuel Calvin, it contains the following papers: "Mineral Production in Iowa in 1908," by S. W. Beyer, pp. 1-20; "Coal Deposits of Iowa," by Henry Hinds, pp. 21-396; "Fuel Values of Iowa Coals," by F. A. Wilder, with analyses of Iowa coals by James H. Lees and A. W. Hixson, pp. 397-519; "History of Coal Mining in Iowa," by James H. Lees, pp. 521-88; "Coal Statistics," by S. W. Beyer, pp. 591-97; "General Section of the Des Moines Stage of Iowa," by James H. Lees, pp. 598-604; "The Carboniferous Section of Southwestern Iowa," by George L. Smith, pp. 605-57; "Bibliography of Iowa Coals," compiled by James H. Lees, pp. 659-87; "Peat Deposits in Iowa," by S. W. Beyer, pp. 689-730; "Bibliography of Iowa Peat," compiled by James H. Lees, pp. 731-33; "Flora of Northern Iowa Peat Bogs," by L. H. Pammel, pp. 735-77.

R. T. C.

Radioactivity and Geology. An Account of the Influence of Radioactive Energy on Terrestrial History. By J. JOLY. Pp. 287, pls. 6, figs. 4. New York: Van Nostrand Co., 1909.

The discovery of radioactivity has opened the way for quite a new conception of many geologic phenomena. Fresh light has been thrown upon obscure and difficult problems, old explanations have been weakened or displaced, and alternative hypotheses have been framed to explain various phenomena. Radioactivity when first discovered appeared to have its chief interest in the domain of the physicist and the chemist. How vital a rôle it may yet prove to play as an active geologic agent, how wide a range of geologic processes it may yet be found to enter as a decisive